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Sweet potato production in Louisiana

Julian Creighton Miller

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By JULIAN C. MILLER AND W. D. KIMBROUGH

LOUISIANA STATE UNIVERSITY
AND
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATIONS

C. T. DOWELL, *Director*

SUMMARY AND RECOMMENDATIONS

1. The Porto Rico is the only variety of sweet potato recommended for commercial production in Louisiana.
2. Sandy to silt loam soils are best for high production, shape, and quality.
3. As sweet potatoes require little cultivation, thorough preparation is essential.
4. Under Louisiana conditions, mutations occur frequently.
5. Constant selection is necessary to maintain desirable skin and flesh color.
6. Seed potatoes should be treated before planting.
7. Six to eight bushels of potatoes should be bedded to produce plants for one acre.
8. In south Louisiana potatoes may be bedded in rows in the open for the main crop.
9. When beds are in field rows, vine cuttings should be made, rather than pulling slips.
10. Sweet potatoes should not be planted on the same land more often than every other year.
11. From 400 to 600 pounds of 4-12-4 or 4-8-4 fertilizer should be applied per acre.
12. Ridged rows 12 to 14 inches high and 3½ to 4 feet apart should be used. Plants should be spaced 12 inches apart in the row.
13. Since time of setting to the field influences the shape of potatoes, the first half of June is the best time to plant in the commercial district of Louisiana.
14. To control weeds about two shallow cultivations are usually necessary.
15. Sweet potatoes should be harvested before frost.
16. October is usually the best time to harvest the main crop as it is usually dry and warm.
17. Care must be taken to prevent bruising of potatoes at harvest time.
18. Marketable potatoes should be carefully graded, picked up and placed in storage crates.
19. To cure potatoes keep them at a temperature of 80° to 85° F. for 10 to 20 days immediately after digging.
20. In south Louisiana artificial heat is unnecessary for curing potatoes harvested in October.
21. After curing, sweet potatoes should be kept at temperatures ranging from 50° to 60° F.
22. Potatoes which are prepared for market should be cleaned thoroughly, well graded and packed attractively.

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Importance

The sweet potato is the most important vegetable crop in the South. The average annual production of this crop in the southern states for the five year period from 1931 to 1936 was 62,268,600 bushels, of which Louisiana produced 5,695,000 bushels. The sweet potato is a major food crop for the people in the South and is also used quite extensively as a feed for livestock. The word potato usually means sweet potato in the South in contrast to meaning Irish or white potato in other sections of the United States. This crop is comparatively easy to grow, for even if it receives very little care some potatoes will be produced. For best results, however, good cultural practices should be followed.

The possibilities of the development of the sweet potato starch industry in the South seem very promising at present. If it does develop, the further production of this crop will be stimulated. The best varieties of sweet potatoes for starch production are not those most suitable for culinary purposes.

Introduction

Although the sweet potato has been the subject of much investigational work, there are many problems yet to be solved. In relation to its importance, this crop has been neglected, due in all probability to the fact that it has been easy to grow and thus has been more or less taken for granted.

The Louisiana Agricultural Experiment Station has conducted several experimental projects with fertilizing, spacing, time of planting, selection, mutations, and storage of sweet potatoes, and expects to continue work with this important crop. Experimental sweet potato plots have been located at Sunset and at Baton Rouge, on soil of the Lintonia silt loam type. Plots 40 by 3½ feet were used. Each treatment was replicated five times in order to partially overcome variability of the soil. The Porto Rico variety and its mutations were used exclusively in the investigations.

It is the purpose of this bulletin to give general recommendations and directions necessary for the production of sweet potatoes, in addition to reporting the results of experimental work conducted.

Types of Sweet Potatoes

Sweet potatoes may be divided into three general types which may be designated as moist, intermediate, and dry. The moist type, which is commonly grown in the South, is often called a yam. The true yam, however, is an entirely different plant from any variety of sweet potato, and is seldom grown in the United States. The moist type becomes soft when it is cooked. This is attributed to the formation of dextrins which are not formed as extensively in the dry type. Immediately after digging, this type of potato does not get as soft after cooking as it does after a period of curing and storing. The dry sweet potato is grown and generally preferred in the North, although the southern type is rapidly increasing in favor in that section

and will probably become even more popular. This type tends to be choky when eaten. The intermediate varieties must be stored for several weeks before they become soft when cooked. These varieties are best for starch production.

Important Varieties

A large number of sweet potato varieties are known at present, but only those few which are considered important will be discussed in this bulletin.

Moist Type

Porto Rico—This variety is by far the most important one grown in the South. It is probably best adapted to the lower South, although it does well throughout the cotton belt. It is the only variety recommended at present for commercial planting in Louisiana.

Two mutations of the Porto Rico are very good for eating purposes, but are not recommended for planting for commercial shipment. These are the Porto Orado (Coker's Gold Skin) and the Porto Morado, which is often erroneously called Improved Porto Rico. The Porto Morado has some purple pigment in the skin and the Porto Orado has a yellow skin, but in other respects they are quite similiar to the Porto Rico.

Nancy Hall—This variety is still grown quite extensively, especially in the northern part of the South. It was once much more important than it is at present but has been replaced with the Porto Rico in many sections.

Dry Type

Big Stem Jersey, Yellow Jersey, Priestley Jersey—These varieties are not grown extensively in the South, although limited quantities are produced for northern shipment. They produce very well in this section, but are difficult to keep free from black rot and do not seem to be adapted to storage in the South.

Intermediate Type

Triumph—This variety is grown to some extent for early shipment to the North. At present, it is considered to be the most promising potato for starch production. The Purple Stem, a mutation of this variety, is increasing in importance and may eventually replace the parent type.

Southern Queen—Though once popular, this variety is not likely to regain its importance unless it has merit as a starch potato.

Porto Blanco—A mutation of the Porto Rico, this is a vigorous growing, high producing potato which is especially suitable for feeding to dairy cattle. It has a high starch content and is promising for starch manufacture.

Soil

Sweet potatoes can be grown with fair success on a wide variety of soil types provided the soil is well drained. In general, light sandy loam soil produces the best quality and shape of potatoes. Mississippi River alluvial land is not considered suitable for quality production of this crop. In Louisiana, silt loam soils are largely used for commercial production, and give high yields. Heavy yields of sweet potatoes cannot be expected on very sandy soils.

Preparation of the Soil

Loose, well prepared soil is essential for successfully growing sweet potatoes because the crop is produced underground and is not cultivated extensively. Ridged rows on which the plants are to be set should be thrown up when the ground is prepared. Rows 3½ to 4 feet wide and 12 to 14 inches high are recommended for Louisiana.

Mutations

There is quite a common complaint in Louisiana that sweet potatoes are not uniformly true to variety. A grower may harvest a mixture of potatoes from a field which has been planted to the Porto Rico variety. This may be due to bedding potatoes of more than one variety for plant production and thus getting a mixture planted in the field. In most cases, however, the grower has planted only the Porto Rico, using his own seed with no attention to selection for a number of years. When his crop seems to be a mixture of varieties he concludes that his potatoes have run out and a new source of seed is necessary. This may not be true, however. It has been found at the Louisiana Agricultural Experiment Station that mutations, or sports, occur rather frequently in fields of the Porto Rico variety in this state. A mutation of the Porto Rico is illustrated in Figure 1. Because of the occurrence of these variations, or mutations, it is often believed by growers that potatoes of different colors will cross or mix if planted close to each other, just as yellow and white corn will. This belief is erroneous, however, because varieties cannot cross unless blooms and seed are produced and a cross can be produced only from a seed which was the result of a cross. This does not happen under field conditions in this state.

Fig. 1. A potato, half of which has mutated to the Porto Orado type. Sprouts grown from the light-colored area and planted, produced potatoes of similar color. Those from lower or darker area produced normal Porto Rico potatoes.

Some of the mutations which have been found produce plants earlier than the parent variety. If early slips are set out to make plants from which vine cuttings will later be taken, the mutations may be rapidly multiplied.

Maintenance of Seed Stock by Selection

The proper selection of seed is very important, though often badly neglected. Selected Porto Rico sweet potatoes for use as seed stock are in great demand, but are just beginning to be available. Many growers must produce plants from sweet potatoes which they have on hand. Under these conditions the crop can be greatly improved by selection of the potatoes to be bedded for plant production. The frequency with which mutations occur emphasizes the necessity for selection of seed stock, if the purity of the variety is to be maintained. Even with the best strain of Porto Rico available, proper selection of seed stock must be practiced if the high standard is to be kept up.

Selection for desirable skin color is not difficult if the potatoes are clean, and should not be neglected. Potatoes with an excessive number of small lateral roots should be closely examined, as they are likely to be off type in both skin and flesh color. To be sure that the inside color is all right, a chip should be cut from the potato near the end by which it was attached to the plant and the flesh color examined. Usually the end to be chipped may be identified by the presence of sprouts, but if it is impossible to tell which is the right end, both of them should be chipped. If the desired color is present at either end, the interior color is all right. Potatoes that do not have typical orange-colored flesh should not be used for plant production. The flesh color of a Porto Rico varies from one end to the other, with the best color being found at the end by which it is attached to the plant. Turnip-shaped potatoes of the Porto Rico variety seem to be a little better colored internally than longer ones, but as long as good color is present the degree makes no difference in seed selection. It is hard to over-emphasize the importance of the examination for flesh and skin color and the selection of seed sweet potatoes on that basis. If this selection is carried out there will be no cumulative effect of the mutations that occur and the strain will not run out on that account. The farmer may thus have his own selection of sweet potatoes.

The shape of the potatoes used to bed apparently has no effect on the shape of those grown from the plants produced. Because of convenience in handling and a probable production of more plants per unit amount, potatoes medium long to long in shape are usually bedded for plant production. Small potatoes are as good for seed purposes as larger ones, provided they come from high-yielding hills. This is shown in Table 1. Small potatoes produce more slips per bushel than larger ones. The continued use of small potatoes for propagation purposes over a period of years is not advisable, however, as there is danger of emphasizing some disease or other factor which may have caused them to be small. The safest procedure in trying to improve a strain is to bed only No. 1 potatoes.

Tests to determine the effect on crop yield of the location of slips on the bedded potato showed that plants from distal end slips produced as high yields as did those from the proximal end. These results are given in Table I.

Table I. Source of Slip Test—Three-Year Average

SOURCE OF SLIP	YIELD IN BUSHELS PER ACRE			
	Jumbos	*No. 1s*	*No. 2s*	*Culls*
No. 1 potatoes	12.7	309.8	46.2	27.8
No. 2 potatoes	29.1	312.7	34.8	26.2
Proximal end	23.6	311.7	32.7	26.6
Distal end	58.7	329.2	32.2	22.9

Seed Treatment

All potatoes should be treated before being bedded, for although they may appear to be entirely free of disease, spores are nearly sure to be adhering to the skin. It is recommended that the seed potatoes be soaked for eight minutes in a solution containing one part of corrosive sublimate (bichloride of mercury) to 1000 parts of water. This means one ounce of corrosive sublimate to eight gallons of water. The crystals of corrosive sublimate should be dissolved in a small amount of hot water in a non-metal container, then added to the proper volume of water in a large barrel or other wooden container. *Metal containers should not be used* because they take the corrosive sublimate out of solution. The potatoes may be placed in crates or sacks and dipped in the solution. When they are removed, the solution should be allowed to drain back into the container. It is not necessary to rinse the potatoes after treatment. After a solution has been used for several times, it should be replaced with a fresh one. Thirty-two gallons of solution should be sufficient to treat about twenty bushels of potatoes.

Corrosive sublimate is a deadly poison and should be handled accordingly. It should not be left where animals can get to it, nor should the treated potatoes be used for food of any kind. There is no seed treatment known that will prevent the spread of blackrot from roots actually infected with this disease. All roots affected with disease should be discarded before the seed is treated.

Bedding Seed Potatoes

The quantity of potatoes to bed will depend on the size of potatoes and the acreage to be planted. From 1500 to 2000 plants may be expected per bushel of No. 1 potatoes of the Porto Rico variety for the entire season that slips may be pulled. A bushel of No. 1 potatoes will require about 15 square feet in the plant bed. A bushel of No. 2s will require more space and will produce more plants. If three pullings of slips are to be made, not quite half of the plants may be expected at the first pulling if the bed is well covered with plants at that time. When slips are to be set 12 inches apart in rows 3½ feet wide, 6 to 8 bushels of sweet potatoes should be bedded to produce plants for an acre. If only the first planted potatoes are to be grown from slips and the rest from vine cuttings from these, enough potatoes to plant about one-sixth of the desired acreage should be bedded. When sweet potatoes are bedded they should be placed close together but not allowed to touch.

In the northern part of Louisiana some source of bottom heat in the bed is necessary to get slips for early planting. Fresh manure of a kind that will heat is probably best for the small plant bed. Flue-heated hot beds in which wood can be burned are probably the most economical where a large quantity of plants is needed. Plants grown in hot beds are usually placed in sand and covered with it to a depth of about four inches. Straw or similar material should be kept handy to protect the plants in case of a freeze.

In south Louisiana it is not necessary to have any specially constructed beds for the production of sweet potato plants. They can be produced in the open without protection early enough to be set in the field at the normal commercial planting time. The potatoes may be bedded in regular rows and covered with soil. Slips are not usually pulled when this method is used, but vine cuttings are made from the growth produced.

Slips vs. Vine Cuttings

The common practice in planting sweet potatoes is to pull slips or draws from the plant bed and set them to the field. Quite often vine cuttings are made from plants grown from early set slips. Vine cutting will cause a reduction in yield of the plants from which cuttings are made.

In south Louisiana the recommended practice is to grow plants in field rows and make vine cuttings instead of pulling slips. This is done largely for sanitary reasons. If slips are pulled, the lower end is in contact with the mother potato and any disease organisms present there may be transferred with the slips. The vine cuttings are made above ground and so are much less likely to spread diseases or the sweet potato weevil. Under favorable conditions, vine cuttings will live equally as well as slips and will produce as high yields.

Rotation

As with most crops, rotation is necessary if best results are to be expected from sweet potatoes. This crop is generally recognized as being a heavy feeder and may deplete the nutrient reserves in the soil if it is grown on the same soil without fertilization for a number of years. As the shape of the roots produced depends to some extent on the looseness of the soil, green cover crops turned under are beneficial, especially on the heavier types of soil. If sweet potatoes are grown year after year on the same soil, diseases and insects will be a much more serious problem than if rotation is practiced.

Fertilization

Sweet potatoes will grow and usually produce a crop, even on poor soils, without fertilization, but best results cannot be expected under these conditions. Good lands is essential if high yields are to be obtained.

Fertilizer experiments were conducted for three years at the Louisiana Agricultural Experiment Station and at Sunset, Louisiana, to determine the fertilizer requirements of sweet potatoes at these places. The type of soil on which the plots were located was Lintonia silt loam. At Louisiana State University, the land had been

Table 2. Rate of Nitrogen Test—Three-Year Average

Treatment NPK*	*Where Grown*	YIELD IN BUSHELS PER ACRE				*Total Yield*	*Increase from Nitrogen of U. S. 1's in Bu. per Acre*
		Jumbos	*U. S. 1*	*U. S. 2*	*Culls*		
6–8–4	Sunset.....	12.4	300.7	41.9	41.0	396.0	26.5
4–8–4	Sunset.....	16.3	276.3	46.5	49.3	388.4	2.1
2–8–4	Sunset.....	10.7	275.6	44.8	44.6	375.7	1.4
0–8–4	Sunset.....	15.7	274.2	44.9	48.7	383.5	....
0–0–0	Sunset.....	3.4	225.1	47.3	43.9	319.7	....
6–8–4	L. S. U.....	64.4	416.1	34.6	29.0	544.1	41.2
4–8–4	L. S. U.....	54.5	414.3	40.2	27.2	536.2	39.5
2–8–4	L. S. U.....	37.4	398.8	46.9	34.8	517.9	24.0
0–8–4	L. S. U.....	28.1	374.8	34.4	33.3	470.6	....
0–0–0	L. S. U.....	25.5	357.1	37.8	29.2	449.6	....

*Fertilizer applied at the rate of 800 pounds per acre.

used for vegetable production for a number of years and had been fertilized regularly with a complete fertilizer. At Sunset the land had been in sweet potatoes for a number of years and had not been fertilized. Legume cover crops were grown at each place and turned under prior to setting in sweet potato plants.

The results of the fertilizer experiments are shown in Tables 2 through 7. In studying the results of fertilizer tests with sweet potatoes, the total yield, as well as the yield of No. 1 potatoes, should be considered. The time of digging will materially affect the grade. As sweet potatoes are graded by hand, there is more variation than there would be if mechanical graders could be used.

TABLE 3. RATE OF PHOSPHORUS TEST—THREE-YEAR AVERAGE

Treatment NPK*	*Where Grown*	YIELD IN BUSHELS PER ACRE				*Total Yield*	*Increase of U. S. 1's in Bu. per Acre from Phosphorus*
		Jumbos	*U. S. 1*	*U. S. 2*	*Culls*		
4–12–4	Sunset.....	12.0	308.9	48.0	49.5	418.4	53.5
4–8–4	Sunset.....	8.7	288.0	45.4	53.6	395.7	32.6
4–4–4	Sunset.....	6.4	279.7	49.4	52.5	388.0	24.3
4–0–4	Sunset.....	6.9	255.4	48.3	55.3	365.9	....
0–0–0	Sunset.....	5.1	226.3	49.9	52.1	333.4	....
4–12–4	L. S. U.....	47.8	405.4	33.6	25.6	512.4	11.5
4–8–4	L. S. U.....	61.5	381.6	35.6	22.5	501.2	−12.3
4–4–4	L. S. U.....	50.8	383.2	33.5	24.9	492.4	−10.7
4–0–4	L. S. U.....	64.2	393.9	37.0	22.5	517.6	....
0–0–0	L. S. U.....	41.0	331.6	39.0	24.6	436.2	....

*Fertilizer applied at the rate of 800 pound per acre.

The results obtained from the fertilizer tests are variable. In general the application of fertilizer resulted in increased yields. Yields were higher at Louisiana State University than at Sunset, largely because the plants were set to the field earlier. The response to fertilizer was not as great at Louisiana State University as at Sunset. This is probably explained by the fact that at Louisiana State University the soil had been fertilized for other crops and there was some residual effect.

The response to nitrogen was more marked at Louisiana State University than at Sunset. This was likely due to the heavier yields produced at Louisiana State University. The results of the nitrogen test indicate that some nitrogen is beneficial but the response to nitrogen was not as great as might be expected. Sweet potatoes, a long-season crop, are heavy feeders and are grown at a time when nitrifying organisms in the soil are most active. In connection with nitrogen fertilization it should be stated that heavy application of nitrogen when plenty of moisture is available may cause excessive vine growth which may make the crop mature later and reduce the yields.

The response to phosphorus was greater at Sunset than at Louisiana State University. At Louisiana State University the residual effect of phorphorus applied evidently nullified the benefit of its application for the duration of the experiment. At Sunset the application of phosphorus was more beneficial because there was no residual effect at the start. It should be stated, however, that a greater response was obtained there the first year of the test than for the other two years. This

means that phosphorous is especially important on new land or on land that has not been fertilized for a number of years. Much of the new land is very deficient in phosphorus and responses to its application are very marked.

The results of the potash test were more erratic than those of the other two elements tested. No response was obtained at Louisiana State University. This again is probably explained by the residual effect of previous applications of potash. It was more effective at Sunset than at Louisiana State University, but the response was not very marked there.

Table 4. Rate of Potash Test—Three-Year Average

Treatment NPK*	*Where Grown*	YIELD IN BUSHELS PER ACRE				*Total Yield*	*Increase of U. S. 1s in Bu. per Acre from Potash*
		Jumbos	*U. S. 1s*	*U. S. 2s*	*Culls*		
4–8–10	Sunset.....	11.5	321.2	44.6	43.6	420.1	32.3
4–8–8	Sunset.....	16.3	288.2	49.6	43.0	397.1	−1.7
4–8–6	Sunset.....	9.1	307.6	46.7	40.4	403.8	17.7
4–8–4	Sunset.....	8.3	313.9	43.2	41.0	406.4	24.0
4–8–2	Sunset.....	5.1	296.6	44.6	43.5	389.8	6.7
4–8–0	Sunset.....	7.5	289.9	47.6	43.0	388.0	....
0–0–0	Sunset.....	7.5	230.8	47.9	43.5	329.7	....
4–8–10	L. S. U.....	64.4	375.5	38.6	27.4	505.9	6.6
4–8–8	L. S. U.....	59.2	352.6	33.4	25.1	470.3	−16.3
4–8–6	L. S. U.....	54.8	331.0	38.9	24.4	449.1	−37.9
4–8–4	L. S. U.....	51.2	369.1	44.1	21.9	486.3	0.2
4–8–2	L. S. U.....	66.1	372.8	41.3	21.5	501.7	3.8
4–8–0	L. S. U.....	65.0	368.9	36.3	25.6	495.8	....
0–0–0	L. S. U.....	32.2	309.8	33.0	24.8	399.8	....

*Fertilizer applied at the rate of 800 pounds per acre.

The tests with rate of application of complete fertilizer showed that a profitable increase in yield was obtained by the application of fertilizer. On the soil where these tests were conducted 400 pounds per acre of 4-8-4 was sufficient. On poorer soils it seems probable that slightly heavier applications would be beneficial and it is suggested that 600 pounds per acre is not too much.

There was considerable interest in concentrated fertilizers at the time these tests were started. Some of the materials used at first became unavailable and the number of treatments was reduced accordingly. Yields obtained show no significant difference in concentrated fertilizers and the standard 4-8-4. Interest in concentrated fertilizers seems to be waning, but the data presented indicate that they can be used successfully with sweet potatoes.

The results of the shrimp meal and cottonseed meal test show an increase in yield of the fertilized plots over the check plots. There was no significant difference between the various fertilizer treatments and the standard 4-8-4. The addition of potash did not increase the yield.

Discussion of Fertilizer Results

The results of the fertilizer experiments showed that sweet potato yields were increased by the application of commercial fertilizers. Larger increases were obtained from the application of phosphorus than from nitrogen or potash. The application

of small amounts of nitrogen was beneficial. The value of potash was doubtful on the soils on which the experiments were conducted. Tests in other sections of the country have shown the advantages of potash and there undoubtedly are soils in Louisiana on which sweet potatoes are grown which will respond to potash. The application of a small amount of potash cannot be harmful and will prevent the reserves in the soil from being depleted. The more easily obtained commercial fertilizers are complete fertilizers. If home mixing of fertilizers is practiced, potash may be left out when fertilizer is to be applied to land that does not respond to this element. In general, it is best to apply a complete fertilizer.

TABLE 5. RATE OF APPLICATION OF COMPLETE FERTILIZER TEST (4-8-4)
THREE-YEAR AVERAGE

Rate of Application Pounds per acre	*Where Grown*	YIELD IN BUSHELS PER ACRE				*Total Yield*	*Increase of U. S. 1s in Bu. per Acre from Fertilizer*
		Jumbos	*U. S. 1s*	*U. S. 2s*	*Culls*		
1000	Sunset.....	9.4	300.0	45.7	47.8	402.9	78.2
800	Sunset.....	17.4	276.9	44.9	45.1	392.5	54.2
600	Sunset.....	7.1	284.2	42.7	44.1	378.1	62.4
400	Sunset.....	10.6	273.2	44.1	45.5	373.4	51.4
200	Sunset.....	6.0	252.5	48.2	48.7	355.4	30.7
000	Sunset.....	1.8	221.8	47.7	41.4	312.7	....
1000	L. S. U	87.0	401.1	41.6	23.3	553.0	80.1
800	L. S. U.....	71.6	378.7	40.9	24.3	515.5	57.7
600	L. S. U.....	64.1	361.1	36.8	20.6	482.6	40.1
400	L. S. U.....	44.9	371.7	38.4	23.3	478.3	50.7
200	L. S. U.....	33.3	356.2	37.1	21.1	461.8	35.2
000	L. S. U.....	50.3	321.0	34.7	18.8	424.8	....

The application of fertilizer that is recommended for sweet potatoes in Louisiana is from 400 to 600 pounds per acre of 4-12-4 or 4-8-4. This should be applied in the row and the rows bedded up one to two weeks before cuttings or slips are set to the field.

SPACING

It is generally recommended that sweet potatoes be planted in rows 3½ to 4 feet apart. Distance apart in the row will depend to some extent on the type of land planted. Plants should be spaced further apart on poor soil than on good soil. Wider spacing tends toward production of more jumbos on good soil. Results of an experiment conducted at Louisiana State University to determine the best spacing distance are shown in Table 8. The 12-inch spacing was best and is generally recommended for the commercial producing districts of Louisiana.

TIME OF SETTING CUTTINGS OR SLIPS

Sweet potatoes may be set in the field as soon as danger from frost is over. When potatoes planted on different dates were dug at approximately the same time, it was found that those planted earliest gave the heaviest yields. These results are given in Table 9. However, the total yield is not always the most important consid-

Table 6. Concentrated Fertilizer Test—Three-Year Average
(Rate Based on N Equivalent in 800 Pounds of 4-8-4)

Treatment	Where Grown	Jumbos	U. S. 1s	U. S. 2s	Culls	Total Yield
Ammophoska 10-30-10	Sunset	1.2	213.0	58.1	48.1	320.4
Nitrophoska 12-24-12	Sunset	2.1	196.9	60.2	44.0	303.2
Nitrophoska 1½(12-24-12)	Sunset	2.5	225.4	61.0	38.7	327.6
Nitrophoska 10-20-20	Sunset	3.4	238.7	65.0	47.8	354.3
NPK 4-8-4	Sunset	3.1	213.5	58.9	47.2	322.7
Ammophoska 10-30-10	L. S. U.	73.6	368.3	34.3	20.6	496.8
Nitrophoska 12-24-12	L. S. U.	63.4	375.6	37.2	22.4	498.6
Nitrophoska 1½(12-24-12)	L. S. U.	74.2	348.7	28.7	21.6	473.2
Nitrophoska 10-20-20	L. S. U.	59.9	371.7	32.1	26.1	489.8
NPK 4-8-4	L. S. U.	45.6	397.8	33.6	21.4	498.4

Table 7. Shrimp Meal and Cotton Seed Meal Test—Three-Year Average
(800 Pounds Per Acre Plus Potash Where Added)

Treatment	Where Grown	Jumbos	U. S. 1s	U. S. 2s	Culls	Total Yield
Phos. 2 parts SM 1 part	Sunset	17.1	262.6	44.8	42.7	367.2
Phos. 2 parts SM 1 part 4%K	Sunset	15.4	260.2	51.4	45.2	372.2
Phos. 3 parts SM 2 parts	Sunset	13.9	238.9	47.2	42.5	342.5
Phos. 2 parts CSM 1 part	Sunset	5.9	247.4	50.3	37.9	341.5
Phos. 2 parts CSM 1 part 4%K	Sunset	15.9	255.0	47.5	45.4	363.8
NPK 4-8-4	Sunset	20.5	249.6	56.8	47.2	374.1
Check	Sunset	5.2	205.3	49.4	43.8	303.7
Phos. 2 parts SM 1 part	L. S. U.	81.8	375.2	37.9	18.9	513.8
Phos. 2 parts SM 1 part 4%K	L. S. U.	94.3	373.2	35.1	20.1	522.7
Phos. 3 parts SM 2 parts	L. S. U	92.7	369.5	36.0	19.1	517.3
Phos. 2 parts CSM 1 part	L. S. U.	77.1	357.7	40.5	20.4	495.7
Phos. 2 parts CSM 1 part 4%K	L. S. U.	81.0	327.2	36.0	21.4	465.6
NPK 4-8-4	L. S. U.	94.0	386.7	39.3	22.6	542.6
Check	L. S. U.	54.3	337.7	38.1	18.8	444.9

Table 8. Spacing Test—Three-Year Average

Distance Apart in the Row	YIELD IN BUSHELS PER ACRE				*Total Yield*
	Jumbos	*No. 1s*	*No. 2s*	*Culls*	
9 inches	32.1	338.4	33.6	26.9	431.0
12 inches	41.2	373.6	36.3	25.4	476.5
15 inches	34.5	357.5	35.2	23.2	450.4
18 inches	62.8	319.6	28.0	20.8	431.2
21 inches	59.3	308.0	27.9	17.6	412.8

Table 9. Effect of Planting Date on Total Yield of Sweet Potatoes

Planting Date	*Date of Harvest*	*Total Yield in Bushels per Acre*
May 15	October 24	686.1
June 10	November 15	458.1
July 23	November 19	259.2

eration in growing sweet potatoes. If this crop is grown commercially, the yield of No. 1 potatoes is most important, and often the yield of fancy No. 1s determines the return from the crop. It has been found at the Louisiana Agricultural Experiment Station that the planting date affects the shape as well as the size of sweet potatoes. In general, the earlier the plants are set out, the heavier is the yield of jumbo potatoes. The effect of planting date on the shape of potatoes is shown in Fig. 2 and Table 10. The earlier the plants were set the greater was the percentage of flat, turnip-shaped potatoes produced. The later the planting, the longer and narrower were the potatoes. The range in shape of early and late planted potatoes is shown in Table 10.

Table 10. Effects of Date of Planting on the Shape of Sweet Potatoes

Time of Planting	*L/D Ratio*	*Average Length (Cm)*	*Average Diameter (Cm)*
Early, May 6, 1932.....	1.57 ±0.014	12.14	7.74
Late, July 15, 1932.....	2.78 ±0.024	17.15	6.16
Early, April 20, 1933.....	1.33 ±0.023	10.72	8.06
Late, June 15, 1933.....	2.23 ±0.039	13.79	6.18

As earlier plantings are usualy made with slips and later ones with vine cuttings, it might be supposed that this would influence the shape of potatoes produced. That this is not true is shown in Table 11.

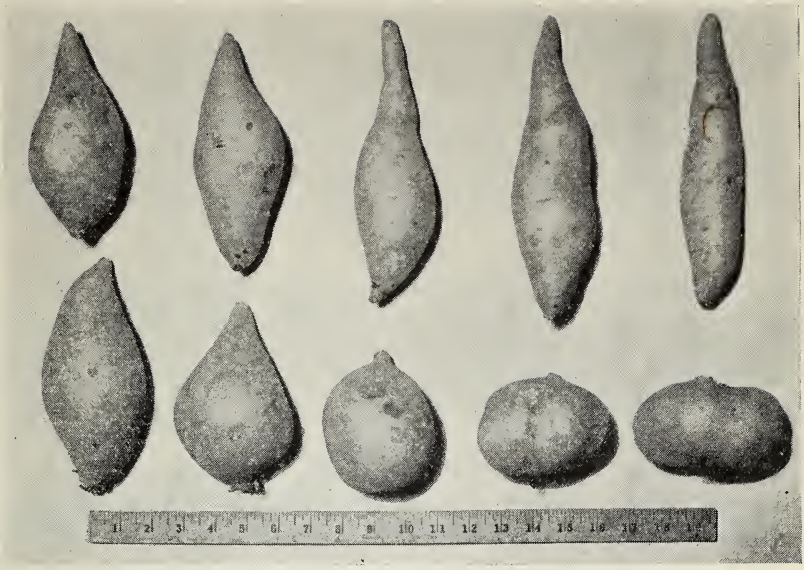

Fig.2. Lower row—potatoes from early planted lot. Upper row—potatoes from late planted lot.

Table 11. Comparisons of Shape of Sweet Potatoes Produced from Slips and Vine Cuttings

Time of Planting	POTATOES FROM SLIPS		POTATOES FROM VINE CUTTINGS	
	Number of Potatoes Measured	*L/D Ratio*	*Number of Potatoes Measured*	*L/D Ratio*
Early	564	1.33	565	1.33
Late	209	2.26	294	2.21

The best type of potato for market is neither too flat nor too slender. Those pictured at the left in Fig. 2 are the most desirable shape. In south Louisiana, the first part of June is the most favorable time for planting to produce potatoes of this shape.

If potatoes are grown for starch manufacture, total yield is of primary importance, therefore early planting should be practiced.

Sweet potato slips or vine cuttings live easily if conditions are favorable at planting time. It is best to set slips or cuttings during rainy spells, or during periods of cloudy weather if the soil is damp. Late afternoon is the best planting time, especially under unfavorable conditions. Watering at planting time will usually

insure the life of the plant except during periods of excessively dry, hot weather. The soil should be firmed around the slip or cutting when it is set. A sweet potato cutting should be 15 to 18 inches in length.

Cultivation

Sweet potatoes require relatively little cultivation. About two shallow cultivations should be sufficient to control weeds and grass until the vines cover the ground, after which they will usually take care of themselves. If weeds and grass are not held in check until the vines get well started, they may choke out the potato vines.

Climate

Sweet potatoes thrive best where the growing season is long and warm. After plants are well established they can withstand periods of drouth successfully. Sweet potatoes are more productive in dry seasons than in wet ones. If there is too much rain, excessive vine growth is produced and the potato yield reduced. Potatoes of best quality are produced in dry seasons.

Harvesting

Maturity of sweet potatoes is a relative term. A sweet potato that weighed approximately 125 pounds was exhibited at the St. Louis Exposition in 1905. This potato was from a plant set by Dr. Stubbs in a greenhouse in Audubon Park, New Orleans, Louisiana, and allowed to grow for several years. A sweet potato, then, does not mature in one growing season, but growth is stopped by digging, disease, frost, or other factors.

The time of digging potatoes will depend somewhat upon marketing. If potatoes are grown for the early market, they should be dug when the yield obtained is high enough to insure a profit at the market price. In general, the earliest potatoes bring the highest price on the early market. However, the increase in yield of potatoes dug later may more than compensate for the decrease in price. It is not desirable to hold over for late digging and storage those potatoes which were planted early for early digging. This is because many may rot in the ground; there may be too many of the jumbo size; the shape may not be as desirable; and they do not seem to keep as well in storage. By digging a part of a row, the grower may determine the type of potatoes present in a field. The early crop of potatoes is usually marketed in July and August.

The main crop of potatoes is dug in the fall. The yield of No. 1 potatoes present in the field will indicate when the potatoes may be dug. Sweet potatoes should be dug before the vines are killed by frost. If they are allowed to stay in the field a few days after a killing frost, their storage and eating qualities will be markedly impaired. It is best to dig sweet potatoes during dry warm weather. In the commercial sweet potato section of Louisiana, the month of October is the best time for harvesting. This is usually a comparatively warm, dry month and potatoes will be dug before danger of a killing frost.

When vine growth is heavy, vines should be cut before the potatoes are plowed out. Various methods are used for plowing out potatoes, but none is especially satisfactory. Care is necessary in this operation to prevent cutting. When heavy yields are obtained, it is necessary to plow two furrows. The first one will cut off about one-third of the row and the other will throw out most of the potatoes.

The potatoes should not be thrown together in heap rows as this will cause excessive bruising. Freshly dug potatoes bruise very easily and if bruised, they will not keep well in storage. It is best to grade the potatoes in the field. U. S. 1s should be carefully placed in crates and taken directly to the storage house. No. 2s may be stored. Jumbos and culls should be used for feed. Storage crates are usually of heavier construction than shipping crates and may be used for several years. The necessity for care in handling sweet potatoes at harvest time cannot be overemphasized. Those that are to be stored or shipped should be handled as little as possible.

Curing

Proper curing immediately after digging is thought to be one of the requisites of success in storing sweet potatoes. Potatoes which are being cured should be kept at a temperature of from 80° to 85° F. for 10 to 20 days, depending upon their dryness at digging time and upon weather conditions. Artificial heat is generally thought to be essential to maintain the proper temperature during the curing period. During this time there may be a shrinkage of 5 to 6 per cent when no rot is present. Early investigators thought that curing was important to remove excess moisture from the potatoes and that it was largely a drying process. When it was found that the moisture content might vary little from digging time until after curing, loss of solids seemed to be important. Experiments were run to determine what part of the shrinkage during curing was due to loss of solids and what part to loss of moisture. By measuring the carbon dioxide of respiration during the curing period, it was found that solids to the extent of approximately 1 per cent of the original fresh weight were lost during the curing period. This means that while shrinkage during curing is largely loss of moisture, the loss of solids is not a negligible factor. The shrinkage is loss to the producer, since the consumer gets a little higher food value per unit of potatoes after they are cured than he would before curing. A greater shrinkage during curing occurs in potatoes having the higher moisture contents at digging time. Some potatoes may have higher moisture contents after curing than do others immediately after digging. This indicates that moisture relationships are not the only important ones in curing. Workers in the United States Department of Agriculture have found that conditions recommended for curing sweet potatoes are ideal for healing of wounds. As all sweet potatoes when dug have wounds that must heal to offer resistance to rot organisms, the healing of wounds may be the most important thing accomplished by curing.

Just what is meant by a cured potato is rather indefinite. Tests to determine whether or not a potato is cured are often given, but no reliable test is known to tell when the curing period is over.

At digging time sweet potatoes are, in general, low in sugar content. During the curing period, a part of the starch changes to sugar and the percentage of sugar increases, in spite of the high rate of respiration at curing temperatures. This increase in sugar content continues for a time during storage. This explains why sweet potatoes are not as good immediately after digging as they are after curing and a period of storage.

Storage

Since there are available bulletins on the subject of sweet potato storage houses, it is unnecessary to describe them, other than to say that they should be well insulated and well ventilated.

After they are cured, sweet potatoes should be stored at temperatures ranging from 50° to 60° F. The relative humidity should be such that no moisture accumulates on the walls, crates, or potatoes. At temperatures below 50° F. sugar accumulates more rapidly than it does at higher temperatures, but the potatoes will not keep for any length of time. Workers in the United States Department of Agriculture have found that sweet potatoes are especially susceptible to rot injury at temperatures below 50° F. This probably explains why they will not keep at lower temperatures. Exposure of potatoes to temperatures below 50° F. and above the freezing point for short intervals may not be injurious, but unnecessary risks should not be taken.

It is best to store sweet potatoes in crates and not handle them from the time they are placed in storage until they are removed for use. It is possible to keep potatoes in bulk in bins, but if this is done the bins should be no more than 3 feet wide by 8 feet deep, and the potatoes not more than 6 to 7 feet deep in the bin. In any case, provision must be made for good air circulation around the stored potatoes. A space of four inches should be left between bins for ventilation. Rats and mice should be kept out of the storage house as they injure potatoes and spread rot.

Sweet potatoes are stored to some extent in banks or mounds. This is not a reliable method of storage and should be used only for potatoes to be used at home, when no suitable place in a building is available. Potatoes to be shipped should never be kept in bank storage.

In south Louisiana the temperature during the month of October is comparatively high and that month is usually dry. Curing with artificial heat is not generally practiced in this section, even in the commercially important Sunset district. Experiments were run to compare sweet potatoes cured and stored in a storage house where artificial heat was used with those kept in a building that could be given good ventilation but was not artificially heated. Potatoes of the Porto Rico variety that were planted and dug at different times were used. Moisture determinations were made at time of harvest, after curing, and at intervals during the storage period to determine the effects of the treatments used on the moisture content of the potatoes. Twelve one-bushel crates of sweet potatoes were used for each treatment. Shrinkage during curing and for the storage period and loss due to rot were determined.

The results of this test are shown in Table 12. These data show that there was little difference in the keeping of potatoes due to storage treatment. During the curing period, the shinkage was slightly less in the artificially heated lots which were planted and dug earlier; the reverse was true in the case of those planted and dug later. Curing conditions when no artificial heat was used were not as favorable for the later dug lots as they were for those dug earlier in the season. Total shrinkage for the storage season was about the same in both types of storage used. There was no consistent difference in amount of rot in comparable lots stored under the different conditions. There was a higher percentage of rotten potatoes in the lots which were planted earlier and dug earlier than in the lots which were planted and dug later. The shorter storage period might account for this, but there was some indication that the shape of the potatoes affected their keeping qualities, since the chunkier ones did not keep so well.

Variations in moisture content are shown in Table 13. This varied considerably from season to season and with the time of digging during a given season. In general, the moisture content was lower in the potatoes which were planted and

Table 12. Shrinkage and Loss from Rot in Sweet Potatoes Cured and Stored Where Artificial Heat Was Used Compared With That in Those Where No Artificial Heat Was Used

Year	Date of Harvest	Treatment	Shrinkage During Curing Per cent	Shrinkage for Storage Period. Per cent	Length of Storage Period		Loss from Rot at End of Storage Season. Per cent
					Mos.	Days	
1930–1931	Nov 7	Artificial heat		14.00	4		.56
		No artificial heat		13.90			.43
1931–1932	Oct. 22	Artificial heat	6.14	15.04	4	11	11.53
		No artificial heat	6.93	14.50			11.60
	Dec. 7	Artificial heat	5.71	9.77	2	27	.46
		No artificial heat	3.16	9.48			2.96
1933–1934	Oct. 10	Artificial heat	4.53	10.86	4		6.76
		No artificial heat	4.80	11.79			7.26
	Nov. 2	Artificial heat	6.52	11.68	3	10	4.44
		No artificial heat	4.41	10.62			1.15
1934–1935	Oct. 26	Artificial heat	6.23	11.82	3	10	2.00
		No artificial heat	6.97	12.08			2.79
	Nov. 17	Artificial heat	4.87	10.03	2	18	2.55
		No artificial heat	3.61	8.52			1.50

dug later. Changes in moisture content during curing varied with the moisture present in the potatoes at digging time, reductions, in general, being greater when higher percentages were present at the time curing was started. There was very little difference in moisture content and variations were not consistent between potatoes which received artificial heat and those which did not. In general, change in moisture content after the curing period was not appreciable. After the curing period no consistent differences due to storage treatment were found in moisture contents of potatoes. The data also show that the moisture in some lots of potatoes at digging time was lower than in others after the curing period.

It is possible to successfully cure and store sweet potatoes in south Louisiana, and probably throughout the far South, without artificial heat. In the Sunset area, large quantities of sweet potatoes are stored in warehouse-like buildings. The potatoes themselves seem to furnish sufficient warmth during cold spells to render artificial heating unnecessary during the storage period. Most of the crop is dug during the month of October.

Marketing

The most important factors to be considered in marketing a crop successfully are (1) to produce a product that the consumers want; (2) to prepare the product for sale in an attractive manner, which means that it must be clean and well graded; and (3) to maintain a constant supply throughout the year. If Louisiana is to hold her high position in the market, these factors must be kept in mind constantly.

Table 13. Comparison of Moisture Contents of Sweet Potatoes Cured and Stored With and Without Artificial Heat

Year	Date of Harvest	Treatment	Moisture Content Per cent			Date Removed from Storage
			At Digging Time	After Curing Period	At End of Storage Period	
1930	Nov. 5	Artificial heat	74.04	72.21	71.33	April 9
		No artificial heat		71.66	71.99	
	Nov. 8	Artificial heat	73.85	71.83	70.88	April 9
		No artificial heat		71.66	71.61	
1931	Oct. 22	Artificial heat	72.35	70.38	70.72	March 4
		No artificial heat		71.24	70.71	
	Dec. 7	Artificial heat	71.31	70.18	68.41	March 4
		No artificial heat		69.16	70.64	
1932	Oct. 13	Artificial heat	74.99	71.51	70.83	Feb. 27
		No artificial heat		70.59		
	Nov. 10	Artificial heat	71.67	70.21	68.10	Feb. 27
		No artificial heat		69.30	69.71	
1933	Oct. 10	Artificial heat	72.70	71.66	72.76	Feb 14
		No artificial heat		71.64	72.48	
	Nov. 2	Artificial heat	67.62	67.58	69.96	Feb. 14
		No artificial heat		68.37	67.78	
1934	Oct. 26	Artificial heat	72.06	72.01	70.96	Feb. 5
		No artificial heat		72.03	71.21	
	Nov. 17	Artificial heat	70.01	67.94	68.09	Feb. 5
		No artificial heat		67.96	69.27	

Grading and Packing

Since sweet potatoes must be handled carefully and as few times as possible, the most convenient place for preliminary grading is in the field at harvest time. At this time the grades U. S. Fancy, U. S. No. 1, and U. S. No. 2 should be placed in field crates, which are then hauled to the packing shed or to the storage house, depending upon season and marketing period.

There are two distinct methods used in Louisiana for preparing sweet potatoes for market. First: the freshly harvested potatoes are delivered to the packing shed where they are washed, given a final grading, and packed carefully in a lengthwise position in the shipping crate. Washing the potatoes is practiced from July 15, when the harvesting of the new crop begins, until about the last of October. At this time the shipments of cured potatoes start and the second method of cleaning is used. After curing, the potatoes are cleaned with burlap brushes for shipment. The brush is made from about one-fourth square yard of burlap material, usually from old sacks, by bringing the corners together and folding the center or middle portion to make a handle which is bound tightly with wire or strong cord. With such a cleaner, the packers make two or three strokes, turning the potato at each pass of the brush. In this manner, the potatoes are brushed free of soil and present

a clean, attractive appearance. As previously mentioned, they are placed in the shipping crates by hand. The cleaners and packers should wear cloth gloves to prevent scratching or bruising the potatoes with the fingernails.

Most of the potatoes shipped from Louisiana are packed in one-bushel wire-bound crates which are usually lined with a bright colored paper. It is the usual practice to ship only potatoes grading U. S. Fancy and U. S. No. 1. When there is a scarcity, however, some U. S. No. 2s are shipped. The No. 2 grade is sold to local markets and to truckers who haul them to markets of intermediate distance. These potatoes are usually packed in 100-pound sacks and the end of the sack is sewed to expose them to view.

Grades

Following are the grades and descriptions for sweet potatoes as formulated by the Bureau of Agricultural Economics of the United States Department of Agriculture:

U. S. No. 1 shall consist of sweet potatoes of similar varietal characteristics which are firm, not badly misshapen; which are free from black rot, decay, and freezing injury; and free from damage caused by dirt, secondary rootlets, bruises, cuts, scars, growth cracks, scald, scurf or other diseases, weevils or other insects, and mechanical or other means.

Unless Otherwise Specified, the diameter of each sweet potato shall not be less than 1¾ inches nor more than 3½ inches, and the length shall not be less than 3 inches nor more than 10 inches, but the length may be less than 3 inches if the diameter is 2 inches or more.

Tolerances. In order to allow for variations other than size, incident to proper grading and handling, not more than 10 per cent, by weight, of the sweet potatoes in any lot may be below the requirements of this grade, but not to exceed a total of 5 per cent, shall be allowed for defects causing serious damage, and not more than 1/5 of this amount, or 1 per cent, shall be allowed for sweet potatoes affected with soft rot.

In addition, not more than 10 per cent, by weight, of the sweet potatoes in any lot may not meet the size requirements, but not more than one-half of this tolerance, or 5 per cent, shall be allowed for sweet potatoes which are below the minimum size requirements.

U. S. No. 2 shall consist of sweet potatoes of similar varietal characteristics which are firm and which are free from black rot, decay, and freezing injury; and free from serious damage caused by dirt, bruises, cuts, scars, growth cracks, scald, disease, weevils or other insects and mechanical or other means.

Unless Otherwise Specified, the diameter of each sweet potato shall not be less than 1½ inches nor more than 4 inches.

Tolerances. In order to allow for variations other than size, incident to proper grading and handling, not more than 10 per cent, by weight, of the sweet potatoes in any lot may be below the requirements of this grade, but not to exceed 1/10 of this amount, or 1 per cent, shall be allowed for sweet potatoes affected with soft rot.

In addition, not more than 10 per cent, by weight, of the sweet potatoes in any lot may not meet the size requirements, but not more than one-half of this tolerance, or 5 per cent, shall be allowed for sweet potatoes which are below the minimum size requirements.

U. S. Fancy shall consist of sweet potatoes of similar varietal characteristics which are firm, smooth, and well shaped; which are free from black rot, decay, and freezing injury; and free from damage caused by dirt, secondary rootlets, bruises, cuts, scars, growth cracks, scald, scurf or other disease, weevils, or other insects and mechanical or other means.

The diameter of each sweet potato shall not be less than 2 inches or more than 3½ inches and the length shall not be less than 3 inches nor more than 6 inches, but the length may be less than 3 inches if the diameter is 2¼ inches or more.

Tolerances. In order to allow for variations other than size incident to proper grading and handling, not more than 10 per cent, by weight, of the sweet potatoes in any lot may be below the requirements of this grade, but not to exceed a total of 3 per cent, shall be allowed for defects causing serious damage, and not more than 1/3 of this amount, or 1 per cent, shall be allowed for sweet potatoes affected with soft rot.

In addition, not more than 10 per cent, by weight, of the sweet potatoes in any lot may not meet the size requirements, but not more than one-half of this tolerance, or 5 per cent, shall be allowed for sweet potatoes which are below the minimum size requirements.

Unclassified shall consist of sweet potatoes which are not graded in conformity with any of the foregoing grades.

Selling and Distribution

Marketing of the Louisiana sweet potato crop is entirely in the hands of local dealers, who in many cases are also large growers. They market their own crops and buy potatoes from other growers or represent a number of growers in what is termed an association. There are few strictly cooperative associations. The dealers, however, make every effort to market the potatoes advantageously. Through the present marketing organizations, sweet potatoes of the best grade are marketed twelve months in the year. Each season finds new markets buying Louisiana Porto Rico sweet potatoes in such quantities that this state now leads all others in car shipments of this important crop.

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